Exam 2--PHYS 102--Chapers 4, 5, & 6a--S13

Multiple Choice
Identify the choice that best completes the statement or answers the question.

___ 1. What is the equivalent resistance of this circuit?

a. 22 Ω  
   b. 13 Ω  
   c. 2.5 Ω  
   d. 7.0 Ω

___ 2. For the previous question, if ε=10 V, what is the voltage across the 4 Ω resistor?

a. 8 V  
   b. 10 V  
   c. 4 V  
   d. 2 V
3. Which of the following equations for this circuit is correct?

\begin{align*}
\text{(a) } & 4-2I_1-12-3I_3=0 \\
\text{(b) } & -4-I_2+5+2I_1=0 \\
\text{(c) } & -I_1+5-12=0 \\
\text{(d) } & I_1+I_3=I_2
\end{align*}

4. Consider the above circuit. If \( I_3 = 2.0 \text{ A} \), what is magnitude and direction of \( I_2 \)?

\begin{align*}
\text{(a) } & 13 \text{ A up} \\
\text{(b) } & 1.0 \text{ A up} \\
\text{(c) } & 1.0 \text{ A down} \\
\text{(d) } & 3.4 \text{ A up}
\end{align*}
5. Which of these statements about a household circuit is true:

I. The household circuit is a series circuit.

II. All devices in a household circuit operate at the same current.

III. As you add more devices to a household circuit, the total current increases.

IV. A ground fault circuit interrupt turns off if $I_{in} > I_{out}$ for any particular device.

a. III & IV  
b. I & IV  
c. III  
d. II & III

6. The wires in this junction have currents as labeled. What is the unknown current (labeled $I=?$)?

\[ \begin{align*}
3A & \quad 7A \\
& \quad I=? \\
& \quad 2A
\end{align*} \]

a. 2 A  
b. 12 A  
c. 10 A  
d. 8 A

7. If the switch S is closed, what happens to the potential across $R_1$?

\[ \begin{align*}
\text{a. decreases} & \quad \text{b. increases} \\
\text{c. stays the same} & \quad \text{d. not enough information}
\end{align*} \]
8. Two resistors are connected in series with a 18 V battery. One of the resistors has a potential of 6 V. What is the potential across the other resistor?

a. 4 V  

b. 24 V  

c. 18 V  

d. 12 V

9. What purpose does the third prong on a three-prong outlet serve?

a. Allow for more stability in the outlet  

b. No purpose  

c. An alternative to the European system of electrical outlets  

d. Act as a ground thus providing a safety feature

10. In a single circuit within your house, what happens to the total resistance as you add electrical appliances?

a. the resistance increases  

b. the resistance decreases  

c. the resistance stays the same  

d. none of these

11. How are natural magnets created?

a. iron mixes with magnetic particles to create a stronger magnet  

b. fossilized dinosaurs are magnetic  

c. molten metal solidifies in the presence of a magnetic field  

d. ferromagnetic materials undergo very high pressure and temperature

12. Which of these statements is true?

a. opposite poles of a magnet attract  

b. magnetic monopoles do not exist  

c. all permanent magnets are ferromagnetic  

d. all of these are true

13. The Earth’s magnetic field plays a role in which of these atmospheric phenomena:

a. aurora borealis  

b. atmospheric refraction  

c. mirages  

d. high-energy particle showers
14. A negatively charged particle enters a magnetic field as shown. What is the force acting on the particle?

- a. 
- b. 
- c. 
- d. 

15. You push a wire through a magnetic field of 8.0 T. The wire is 2.0 m long. You apply a force of 32 N to move the wire. What current is generated in the wire?

- a. 510 A 
- b. 0.00020 A 
- c. 0.50 A 
- d. 2.0 A 

16. This wire is in a magnetic field as shown. The wire feels a force to the right. What is the direction of the current?

- a. up 
- b. down 
- c. zero 
- d. not enough information
17. A coil of copper wire, which is allowed to rotate about the axis shown with the dashed line, has a current going through it as shown. What is the initial direction of rotation for the coil?

a. Counterclockwise  
   b. Clockwise  
   c. It remains stationary

18. This figure shows the path of a charged particle. What is the charge of the particle?

a. positive  
   b. negative  
   c. neutral  
   d. not enough information
19. A charged particle enters a mass spectrometer. The magnetic field inside the device is 0.4 T, the velocity of the particle is $2.0 \times 10^6$ m/s, and the radius of the particle’s path is 0.052 m. From the information given here, what is this particle?

<table>
<thead>
<tr>
<th>Particle</th>
<th>Mass</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>$1.67 \times 10^{-27}$ kg</td>
<td>$1.6 \times 10^{-19}$ C</td>
</tr>
<tr>
<td>Deuterium</td>
<td>$3.35 \times 10^{-27}$ kg</td>
<td>$1.6 \times 10^{-19}$ C</td>
</tr>
<tr>
<td>Tritium</td>
<td>$5.01 \times 10^{-27}$ kg</td>
<td>$1.6 \times 10^{-19}$ C</td>
</tr>
<tr>
<td>Helium-3</td>
<td>$5.01 \times 10^{-27}$ kg</td>
<td>$3.2 \times 10^{-19}$ C</td>
</tr>
</tbody>
</table>

a. Helium-3  
b. Tritium  
c. Deuterium  
d. Hydrogen

20. The speed of light in a vacuum is $3 \times 10^8$ m/s. Glass has an index of refraction of $n=1.5$. What is the speed of light in glass?

a. $3 \times 10^8$ m/s  
b. $2 \times 10^8$ m/s  
c. $6 \times 10^8$ m/s  
d. $4.5 \times 10^8$ m/s

21. Isaac Newton believed light was a ___________ because of ______________. 

a. particle, interference  
b. wave, refraction  
c. particle, photoelectric effect  
d. particle, reflection
22. Light is incident on a glass plane mirror, as shown in this figure, with an incident angle of 20°. What is the reflected angle? (The index of refraction for glass is 1.5)

- a. 45°
- b. 31°
- c. 20°
- d. 13°

23. Interference is a phenomena that is observed in which of these?

- a. wave
- b. particle
- c. neither

24. Bubble “A” for this question.

- a. A
- b. B
- c. C
- d. D
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Answer Section

MULTIPLE CHOICE

1. ANS: C  PTS: 1
2. ANS: A  PTS: 1
3. ANS: B  PTS: 1
4. ANS: B  PTS: 1
5. ANS: A  PTS: 1
6. ANS: B  PTS: 1
7. ANS: B  PTS: 1
8. ANS: D  PTS: 1
9. ANS: D  PTS: 1
10. ANS: B  PTS: 1
11. ANS: C  PTS: 1
12. ANS: D  PTS: 1
13. ANS: A  PTS: 1
14. ANS: C  PTS: 1
15. ANS: D  PTS: 1
16. ANS: B  PTS: 1
17. ANS: B  PTS: 1
18. ANS: B  PTS: 1
19. ANS: D  PTS: 1
20. ANS: B  PTS: 1
21. ANS: D  PTS: 1
22. ANS: C  PTS: 1
23. ANS: A  PTS: 1
24. ANS: A  PTS: 1